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EXAMINER	
VALENCIA, DANIEL E	

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Please find below and/or attached an Office communication concerning this application or proceeding.

A 'A

Office Action Summary	Application No. 10/081,396	Applicant(s) YOO, SUNG-JOO BEN
	Examiner Daniel E Valencia	Art Unit 2874

-- Th MAILING DATE of this communication app ars on the cover sheet with the correspondenc address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *26 March 2003* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-21 and 24-29* is/are pending in the application.

4a) Of the above claim(s) *11-21* is/are withdrawn from consideration.

5)☒ Claim(s) *8-10* is/are allowed.

6)☒ Claim(s) *1-7 and 24-29* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☒ Claim(s) 1-21, 24-29 are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *22 February 2002* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) *2 and 5* .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

This Office Action is in response to the communication filed March 26, 2003. Applicant has elected Group I with traverse. In accordance with the communication, claims 1-10 and 24-29 will be examined; claims 22-23 have been cancelled, and claims 11-21 have been withdrawn from consideration.

Applicant's election with traverse of Group I in Paper No. 6 is acknowledged. The traversal is on the ground(s) of Applicant's assertion that Groups I, II, and III are not properly classified and claim 19 is a linking claim. This is not found persuasive because the Examiner disagrees and deems the classification of the different inventions proper. Additionally, claim 19 does not link to claim 1, also making the restriction requirement proper. The requirement is still deemed proper and is therefore made FINAL.

Specification

The lengthy specification has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claim 24 rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 24 recites the limitation "said substrate" in the first line of the claim. There is insufficient antecedent basis for this limitation in the claim.

Claim Objections

Claim 24 is objected to because of the following informalities: Examiner is of the opinion that there is a typographical error in line 11 of the claim. A period should appear at the end of the claim instead of in line 11. Appropriate correction is required.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1, 3, 5, 6, 7, 24, and 27-29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tsuyama U.S. Patent Application Publication No. 2002/0015551 A1. Refer to the appropriate drawings or parts of the specification. Regarding claims 1, 27, 28, 29, and part of claim 24, Tsuyama discloses a plurality (fig. 9, 171) K of first arrayed waveguide gratings configured as optical demultiplexers each including at least one first input and W first outputs; a plurality (172) K second arrayed waveguide gratings

configured as optical multiplexers each including at least W second inputs and one second outputs; a third arrayed waveguide (53) grating having WK third inputs and WK third outputs; a plurality WK of first wavelength converters (51) formed between respective ones of said first outputs and third outputs; and plurality (55) WK of second wavelength converters formed between respective ones of said third outputs and second inputs; a plurality of K first arrayed waveguides gratings arranged in sectors wavelength selectively connecting a first input port to a plurality of first output ports; a plurality K of opto-electronic circuitries (fig 5A) arranged in said sectors receiving optical inputs from said first output ports of respective ones of said first arrayed waveguide gratings and including at least one control electrode; a second arrayed waveguide receiving optical inputs from all of said opto-electronic circuitries; and a plurality of electronic control circuits connected to respective ones of said control electrodes. The figure referred to above does not explicitly show that the demultiplexer, multiplexer, and the m x m mux/demux are arrayed waveguides; however, he discloses that an arrayed waveguide grating is used to implement those functions in the device (paragraphs 95, claim 15, and paragraph 98).

Although Tsuyama does not explicitly state that the arrayed waveguide gratings, the wavelength converters, and the electronic control circuits are formed in the substrate, all electronic circuitry and waveguide devices are formed in a substrate. It follows that this would be an inherent property of the device and would have been obvious to one ordinarily skilled in the art at the time of invention.

Tsuyama further discloses that the wavelength converters can be Mach-Zehnder interferometers (paragraph 118) or tunable lasers (fig 5A), as mentioned in claims 3 and 5. Additionally, the tunable lasers would comprise an electrical chip (91) that would need to be bonded to a substrate, as mentioned in claims 6 and 7.

Claims 1, 3, 24, and 27-29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nakajima U.S. Patent No. 6,522,803 in view of Doerr U.S. Patent No. 6,549,313 and Tsuyama. Refer to the appropriate drawings or parts of the specification. Nakajima discloses an optical cross connect switch with a majority of the limitations of the claimed invention. Regarding parts of claims 1, 24, and 27, Nakajima discloses an optical router (fig 17), comprising: a plurality K of first arrayed waveguide gratings (labeled 'Demultiplexer') formed in a substrate and configured as optical demultiplexers each including at least one first input and W first outputs; a plurality of second arrayed waveguide gratings (labeled 'Combiner') formed in a substrate and configured as optical multiplexers each including at least W second inputs and one second outputs; a routing portion (2) having WK third inputs and WK third outputs; a plurality of WK second wavelength converters (411, 511, 711) at least partially formed in the substrate between respective ones of said third outputs and said second inputs; a plurality K of first arrayed waveguide gratings ('Demultiplexer') arranged in sectors on a first substrate and wavelength selectively connecting a first input port to a plurality of output ports; a plurality K of opto-electronic circuitries (100) arranged in said sectors receiving optical inputs from said first output ports of a respective one of said first arrayed waveguide

gratings and including at least one control electrode; a second arrayed waveguide grating ('combiner') receiving optical inputs from all of said opto-electronic circuitries; and a plurality of electronic control circuits formed in respective second substrates, bonded to the first substrates within respective ones of said sectors and connected to respective control electrodes.

Nakajima however, fails to disclose the third arrayed waveguide grating. Nakajima uses a cross-connect mirror switch to route the signal, instead. On the other hand, Doerr discloses a broadband electronic NxN cross connect switch using tunable lasers that teaches the use of a arrayed waveguide grating (third arrayed waveguide grating) to selectively route signals. Specifically regarding parts of claim 1, 24, and 27, Doerr discloses the "third arrayed waveguide grating formed in a substrate and having WK inputs and WK outputs." Doerr discloses that it is advantageous to use an arrayed waveguide grating as a router, because it allows for N to become very large (col. 6, lines 50-65). In addition, the reference shows the exact topology of the claimed router. In comparing figure 13 in Doerr along with its teachings regarding the arrayed waveguide grating with figures 1, 8, 13, 14, 16-18, 48, and 49 in Nakajima and it's own teachings, one of ordinary skill would realize that the same switch topology would suggest that the references are combinable. Therefore, it would have been obvious at the time of invention to one having ordinary skill in the art to use an arrayed waveguide grating instead of a cross-connect mirror in the device disclosed by Nakajima.

Nakajima and Doerr however; fail to disclose the use of a wavelength converter between the first plurality of arrayed waveguide gratings and the third arrayed

waveguide gratings. On the other hand, Tsuyama discloses a wavelength converter in between the first plurality of arrayed waveguide gratings and the third arrayed waveguide gratings, wherein the converter can be a Mach-Zehnder interferometer or a tunable laser, as described in claims 1, 3, 24, and 27-29. Tsuyama teaches that it is advantageous to use a wavelength conversion device in between the first plurality of arrayed waveguide gratings and the third arrayed waveguide gratings because it allows the converted wavelength to control the route the signal takes through the grating (paragraph 136-139).

Additionally, the Nakajima, Doerr, and Tsuyama references are all from the same field of endeavor, because the three references teach optical routing networks that utilize arrayed waveguide gratings as routers, demultiplexers, and multiplexers. Therefore it would have been obvious to one of ordinary skill in the art at the time of invention to combine Tsuyama's teaching of using a wavelength converter between the first and third arrayed waveguides to the device disclosed by Nakajima and Doerr.

Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Tsuyama in view of Koga U.S. Patent No. 5,617,234. Refer to the appropriate drawings or parts of the specification. Tsuyama as applied above, discloses an optical router with a majority of the limitations of the claimed invention. However, the reference fails to teach the use of a thermoelectric cooler.

On the other hand, Koga discloses an arrayed waveguide grating device that uses a thermo electric cooler to regulate the temperature of the device. Koga teaches

that it is advantageous to be able to cool the waveguide device, to stabilize the transmission of certain wavelengths (col. 8, lines 55-65).

Since Tsuyama and Koga are from the same field of endeavor, the purpose directed by Koga would have been recognized in the pertinent art of the Tsuyama reference. Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to use a thermoelectric cooler in the device disclosed by Tsuyama.

Claims 2, 25, and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tsuyama in view of Zirngibl U.S. Patent No. 5,600,742. Refer to the appropriate drawings or parts of the specification. Tsuyama discloses an optical router with a majority of the limitations of the claimed invention including an electrical control circuit bonded to a chip, as in claim 26; however, the reference does not explicitly state that the first substrate comprises an InP base and the second substrate comprises a GaAs base.

However, Zirngibl discloses a wavelength grating router that teaches the limitation that the Tsuyama reference lacks. Zirngibl discloses that the substrates could be made of InP or GaAs base (col. 2, lines27-28), as described in claims 2, 25, and 26. Zirngibl Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to use InP or GaAs base for the substrate in the device of Tsuyama.

Allowable Subject Matter

Claims 8-10 are allowed.

The following is a statement of reasons for the indication of allowable subject matter: As to independent claim 8, the prior art alone or in combination fails to disclose or render obvious an optical router, comprising: a plurality K of optical splitters wavelength dividing a received optical signal into a first splitter port for wavelengths within a first silica fiber band and into a second splitter port for wavelengths within a different second silica fiber band; a plurality of K optical detectors receiving and detecting optical signals from respective ones of said first splitter ports; a plurality K of first arrayed waveguide gratings each including a first input port receiving optical signals from respective ones of said second splitter ports and further including at least W first output ports; a second arrayed waveguide grating including WK second inputs ports optically connected to respective one of said first output ports and further including WK second output ports; a plurality of K third arrayed waveguide gratings each including W third input ports optically connected to respective ones of said second output ports and further including a third port; a plurality K of lasers emitting light at wavelength within said first silica fiber band; and a plurality K of optical combiners and each having a first combiner input port receiving radiation from a respective one of said lasers and a second combiner input port connected to respective ones of said third output ports and further including an combiner output port output radiation received on said first and second combiner input ports. For example, Tsuyama discloses a similar optical router; however, the reference does not teach the splitters coupled to the first arrayed waveguides, rather the Tsuyama reference teaches the first arrayed waveguides coupled to the splitters. Likewise, the reference does not teach the second arrayed

waveguides coupled to the combiners, rather the reference teaches the combiners coupled to the second arrayed waveguides. The incoming optical signal is split before passing through the demultiplexer (first arrayed waveguide gratings) in the claimed invention; whereas the reference teaches that the signal is first demultiplexed and then split. This is a critical difference between the claimed invention and the prior art.

Conclusion

The prior art documents submitted by the applicant in the Information Disclosure Statements filed on April 14, 2003 and June 5, 2002, have all been considered and made of record (note attached copy of form PTO-1449).

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Lee U.S. Patent No. 6,288,808 discloses the same switch topology as the claimed invention along with the advantages of using AWGs as mux/demux and routers.

Dragone U.S. Patent No. 6,542,655 discloses an NxN crossconnect switch using wavelength routers and switches including AWGs.

Doerr U.S. Patent No. 5,881,079 discloses a wavelength selectable laser with inherent and single mode stability that teaches using AWG as multiplexers and demultiplexers.

Glance U.S. Patent No. 5,764,821 discloses a large capacity local access network that teaches the use of AWGs as mux/demux.

Takada U.S. Patent No. 6,278,813 discloses a wavelength division multi/demultiplexer that uses AWG.

Ishida U.S. Patent No. 5,937,117 discloses an optical cross-connect system that teaches AWG as multiplexers and demultiplexers bonded to electrical circuits for control.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Daniel E Valencia whose telephone number is (703)-305-4399. The examiner can normally be reached on Monday-Friday 9:30-6:00.

The fax phone numbers for the organization where this application or proceeding is assigned are (703)-308-7724 for regular communications and (703)-308-7724 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703)-308-0956.

dv
May 20, 2003

John D. Lee
Primary Examiner